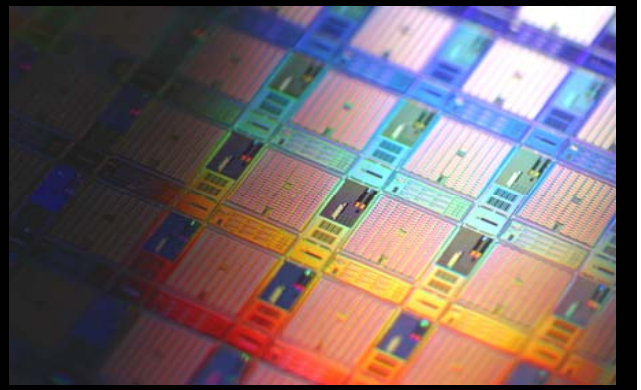


FUJITSU

Fujitsu GDC Studio

Version 1.0.0.0

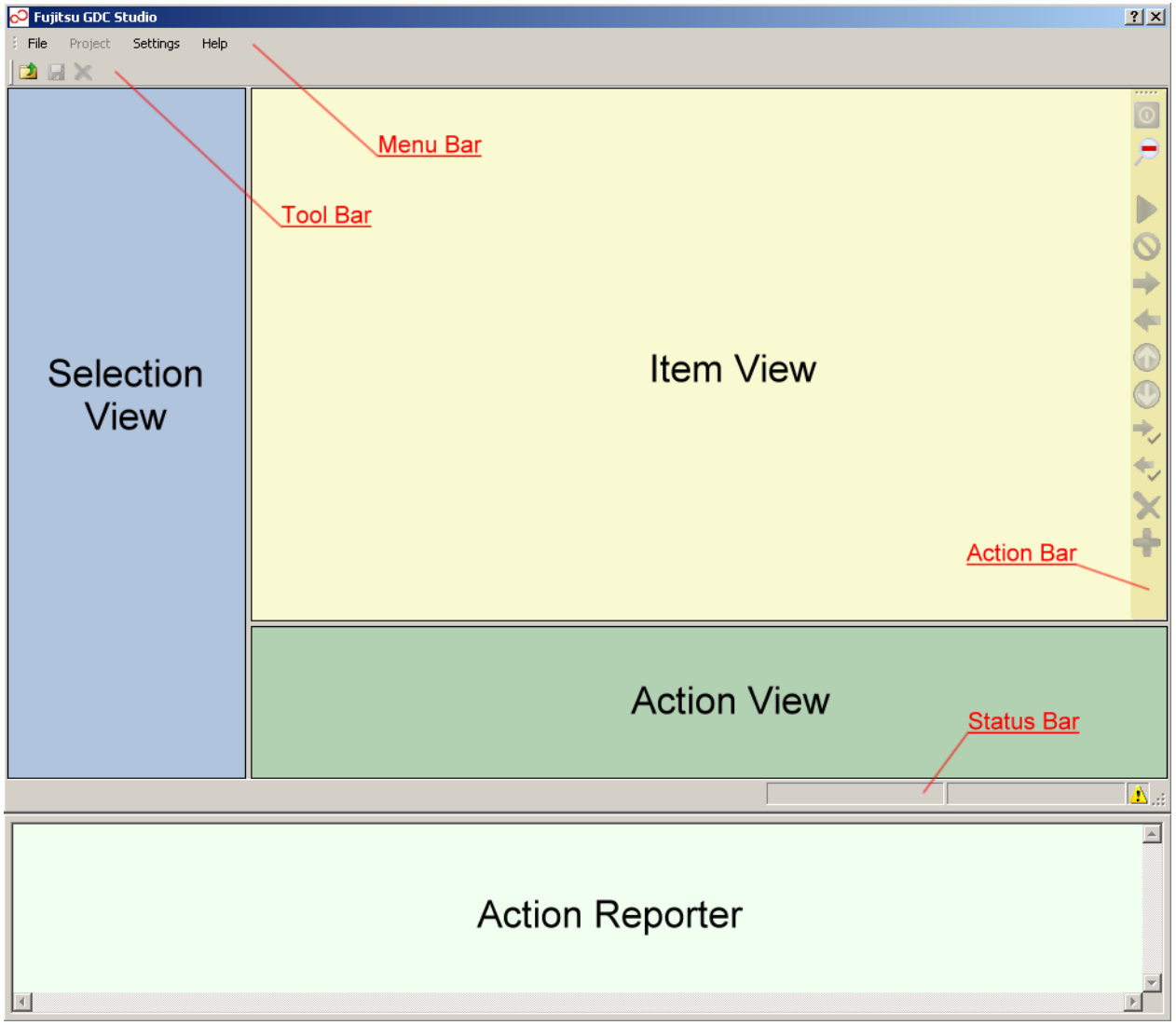
Fujitsu GDC Studio

Graphics Competence Center

- **Background Information :**
  - **The latest version (described here) is: Version 1.0.0.0**
  - **Extensions to the current preview are in progress**
  - **Changes and / or modifications may occur without prior notice**

Fujitsu GDC Studio Layout

Graphics Competence Center



General Features (1)

Graphics Competence Center

Flexible Project File Architecture

- Fujitsu GDC Studio's functionality is configured by loading a chip specific project file (.gdcproj)
- Project files are currently available for :
  - MB88F332 'Indigo',
  - MB86928 'Ruby'
- Additional project files for future Fujitsu chips are planned
- Project files can also be saved / reloaded when a specific chip status should be recorded

Available Features

- GUI based Register Debugger and Register Sequencer
- GUI based Image Manager and Font Manager
- GUI based memory inspection and editing functions:
  - Memory Editor and Hex Dump
  - Flash Editor, Flash Dump and Programmer

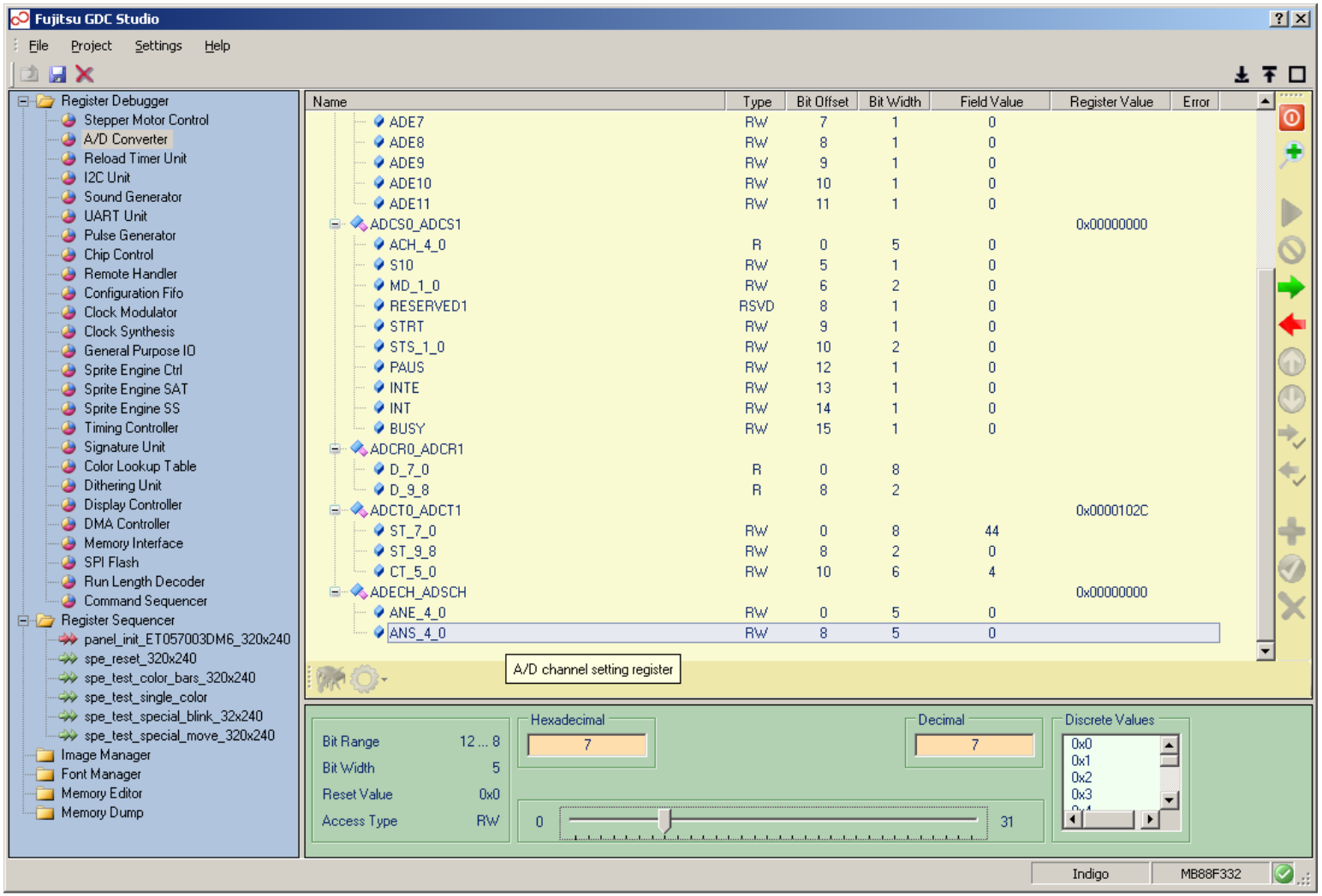
General Features (2)

Graphics Competence Center

- **Modular Hardware Abstraction**
  - Depending on the chip design there are one or more of the following hardware access types possible :
    - SPI – Serial Peripheral Interface (connected via USB)
    - PCIe – Peripheral Component Interconnect Express
  - Additional interface support is possible but currently not planned
- **Automatic Installation Setup Wizard available**
- **User Manual with detailed Information available online**
- **Release notes available online**

Register Debugger - Layout

Graphics Competence Center



Register Debugger (1)

Graphics Competence Center

- Covers the most essential hardware IP‘s of an available design
  - e.g. MB88F332 'Indigo,, MB86928 'Ruby'
- Detailed hardware information is visible for the selected ...
  - IP / Component
  - Address Block
  - Register
  - Register Field
- Practical register/field reads and writes
  - Depending on the register properties, various 'simple to use' controls appear
  - The register access type is handled accordingly (R, RW, W, RSVD, ...)
- Pop-up descriptions of the selected register fields are displayed

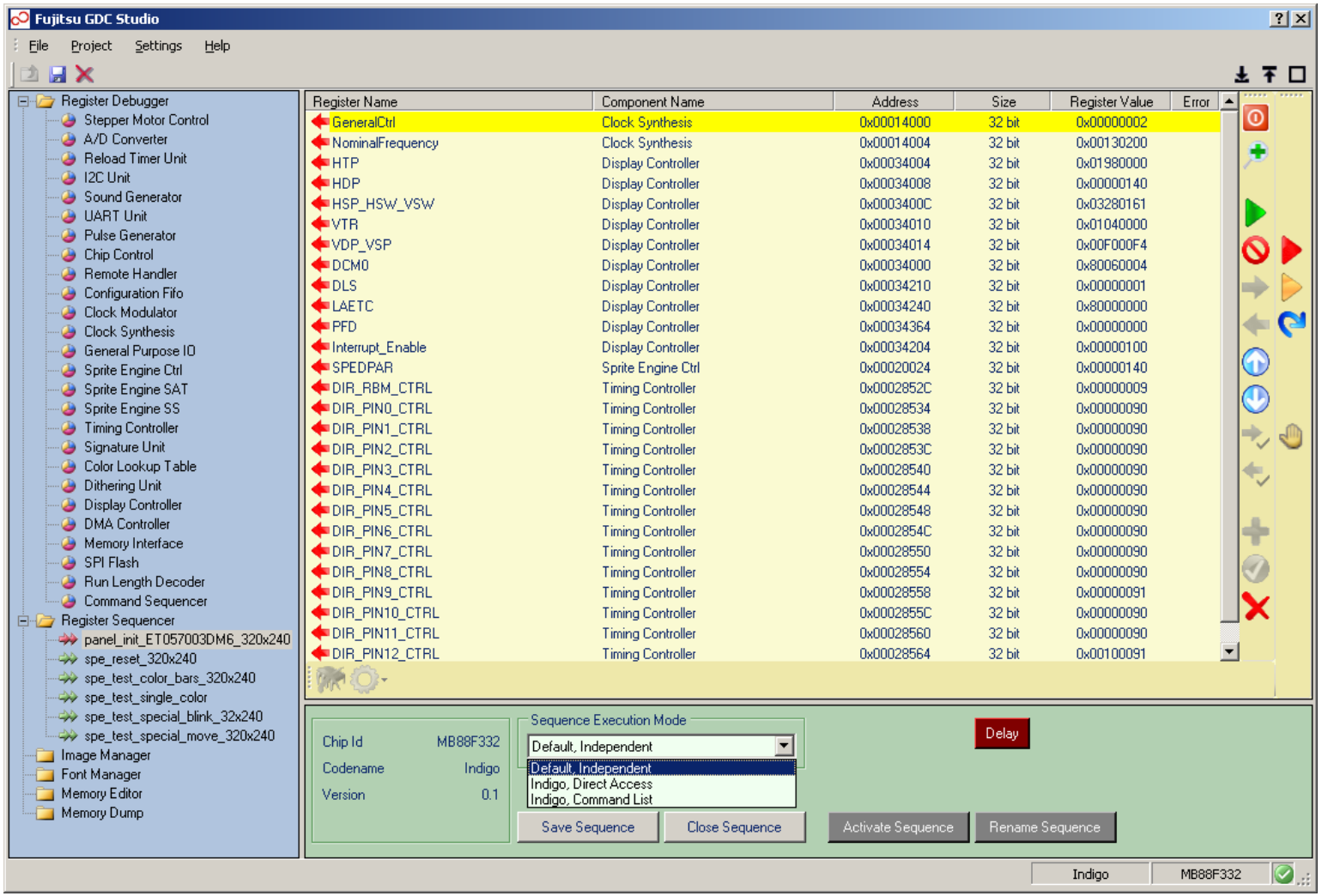
Register Debugger (2)

Graphics Competence Center

- **Hardware access status supported**
  - An 'Error' column reporting the status of each access to the corresponding field is displayed on the far right
  - An additional 'Action Reporting Window' can be opened if detailled access information is needed
- **Hardware connect / disconnect button available**
  - Enables a user to use Fujitsu GDC Studio with a different parallel target application
  - Prevents hardware access problems if GDC Studio and a separate application use the same driver interface
  - Fujitsu GDC Studio may be disconnected or reconnected at any time

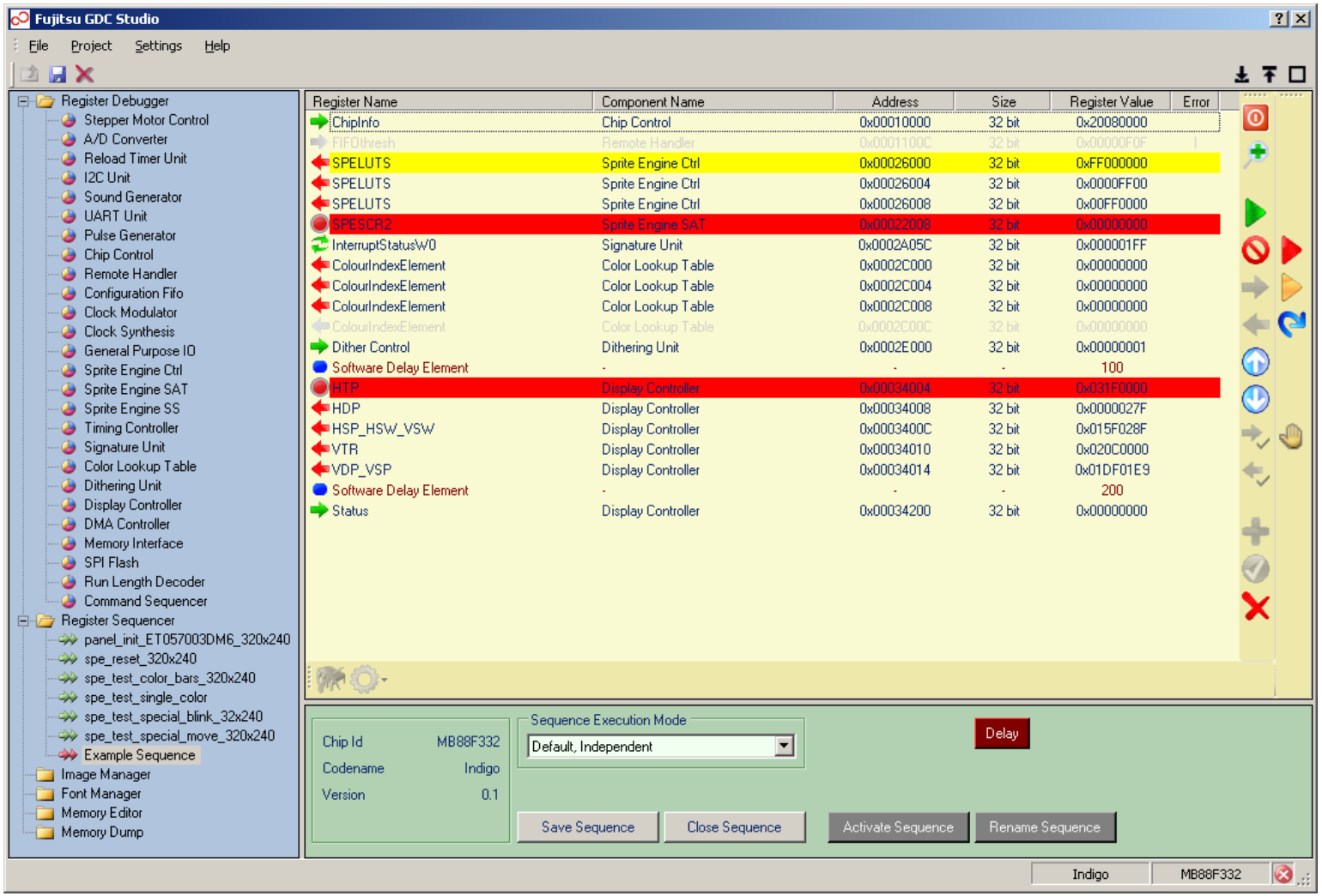
Register Sequencer – Layout

Graphics Competence Center



Register Sequencer - Debug

Graphics Competence Center



Register Sequencer (1)

Graphics Competence Center

- **Easy creation of register sequences**
  - Allows a user to define and create new register sequences
  - Any of the available register sequences can be selected to get input focus
  - The Register Debugger is used to select and add the required registers to the currently active sequence
  - If a special non-listed address (e.g. memory) should be accessed a user defined sequence element can be inserted allowing to configure access type, size, mode, ...
- **Register sequence management implemented**
  - Register sequences can be loaded and saved independently
  - Sequence names can be created and modified
  - Individual sequence items can be repositioned or removed
  - Sequence items can also be deactivated to prevent from execution
  - Values, Masks, Loop counter, ... of the sequence items can be manipulated

Register Sequencer (2)

Graphics Competence Center

- **Execution of selected register sequences**
  - **Play and Stop buttons available when connection to the target chip is detected**
  - **Special modes and functions are available, depending on the supported chip**

Register Sequencer (3)

Graphics Competence Center

Sequence debugging

- It is also possible to debug register sequences
- For this the following debugging functionality is available :
  - Breakpoints
  - 'Single Step'
  - 'Execute to next Breakpoint'
  - 'Stop Sequence'
- Furthermore special sequence items are implemented which support debugging :
  - 'Write' register element
  - 'Read' register element
  - 'Polling Register' elements with a user defined mask and counter
  - 'Write Repeat' element
  - 'Write Repeat Increment' with an address autoincrement

  All Elements above are also available User Defined with a definable address and register size

Image Manager - Layout

Graphics Competence Center

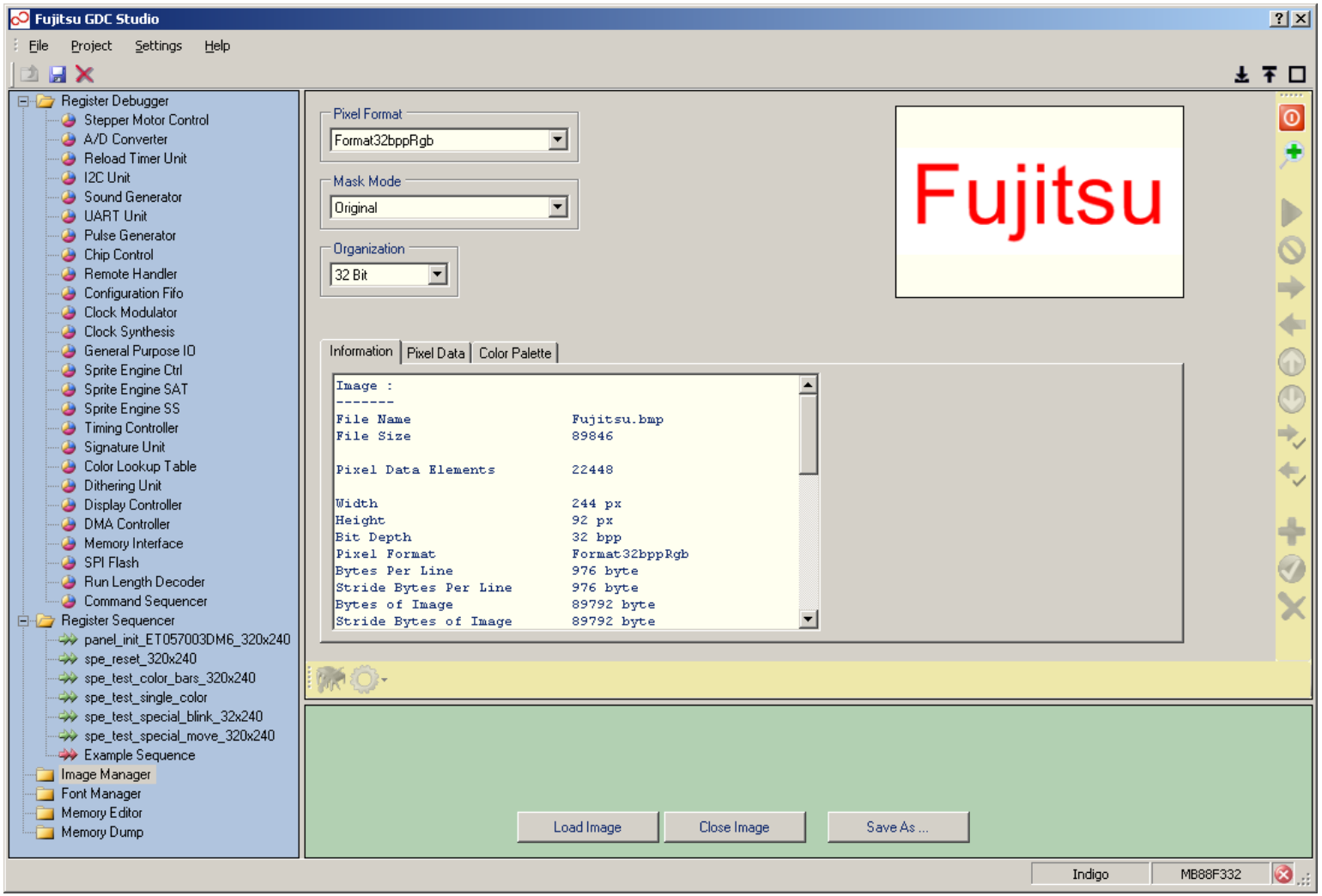


Image Manager – Pages (1)

Graphics Competence Center

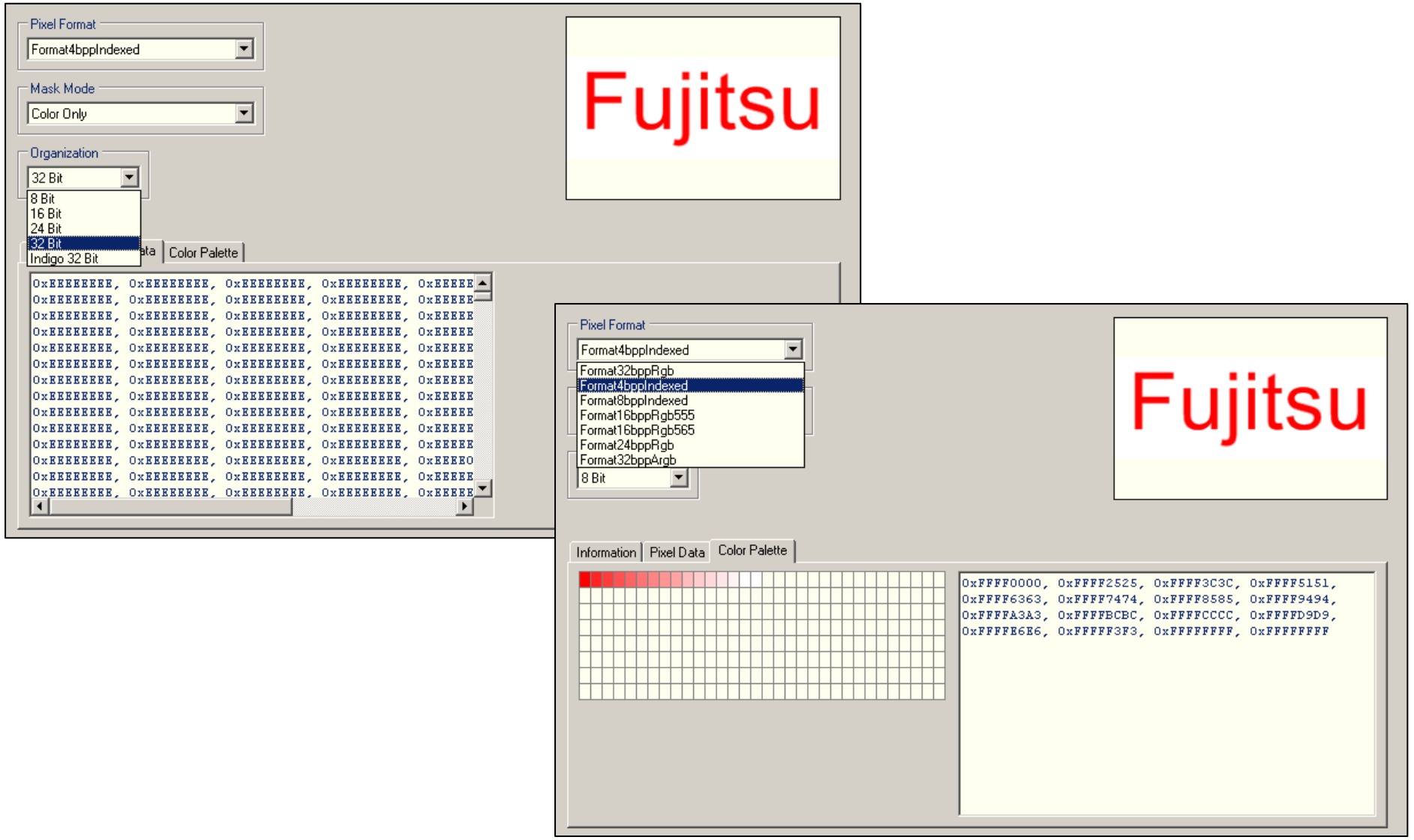


Image Manager – Pages (2)

Graphics Competence Center

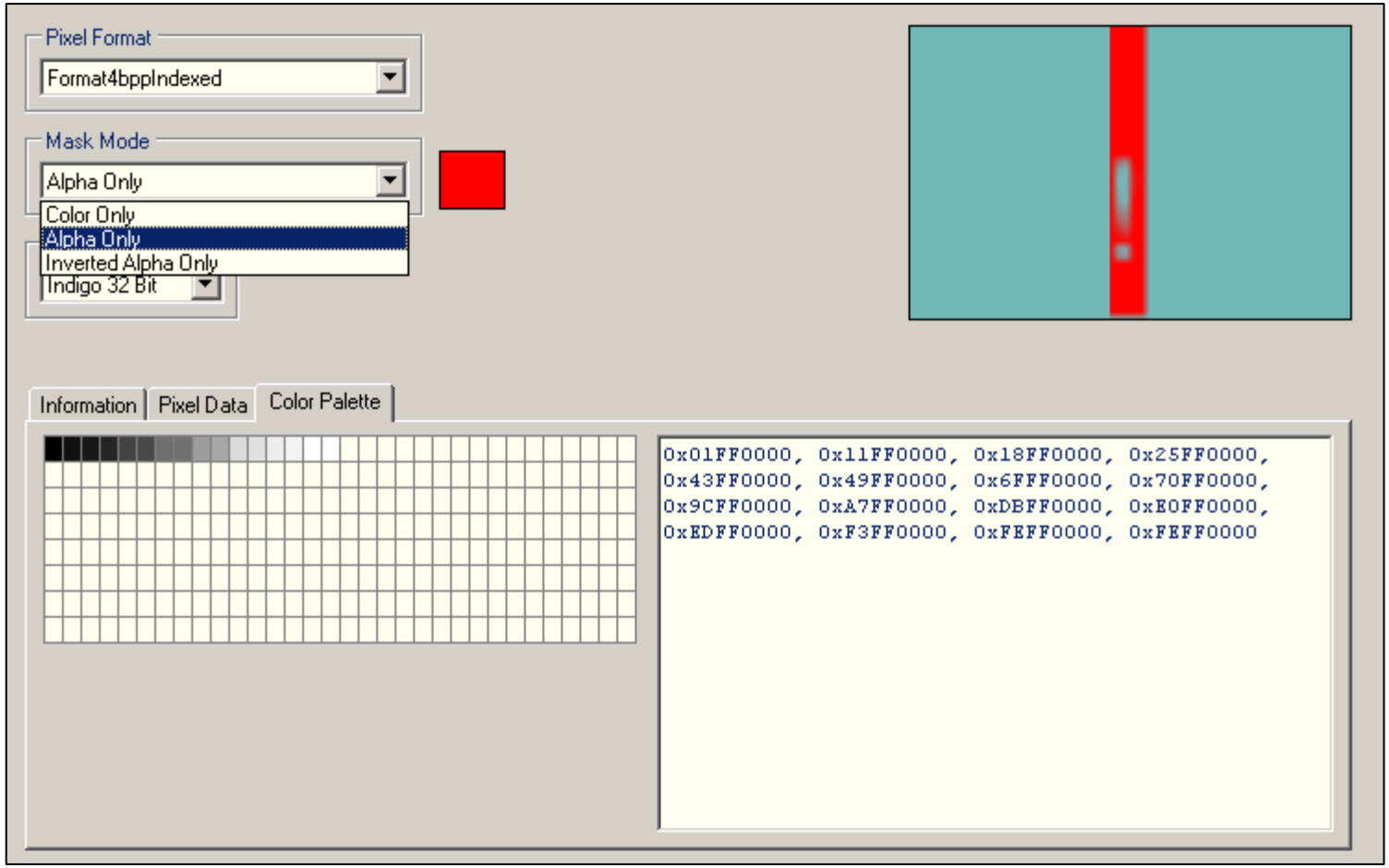


Image Manager (1)

Graphics Competence Center

- **Extract image information for application development**
  - Several pages (tabs) provide functions to extract information from an image file and to make this available for a target application
  - Automatic source ('C') code generation of image information is possible
  - 32 bit organized images can also be saved as binary file (.gdc32dat)
  - An 'Information Page' is available to obtain general image information
  - A 'Pixel Data Page' is available to extract the core pixel values in a specific organization (8, 16, 24 or 32 bit array)
  - A 'Color Palette Page' is available to visualize the colors of indexed format pictures and to create the corresponding Color-Lookup-Tables (CLUTs)
- **Conversion of pixel data into a chip-specific structure**
  - Some chips (e.g. Indigo) require a special pixel data arrangement in memory which can be created/converted by this tool

Image Manager (2)

Graphics Competence Center

- **Conversion into different pixel formats**
  - **Images can be read from different image/file formats**
  - **Images can be converted between different pixel formats**
- **Depending on the input image and the pixel format different 'Mask Modes' will be supported**
  - **Original**
  - **Color Only**
  - **Alpha Only**
  - **Inverted Alpha Only**
  - **Alpha + Color**

Image Manager (3)

Graphics Competence Center

- **Support for images of the following file types:**
  - **Bmp** **Bitmap**
  - **Png** **Portable Network Graphics**
  - **Tiff** **Tagged Image File Format**
  - **Jpeg** **Joint Photographic Expert Group**
  - **Gif** **Graphics Interchange Format**
- **Support for the following pixel formats:**
  - **1 bpp (bit-per-pixel), indexed**
  - **4 bpp, indexed**
  - **8 bpp, indexed**
  - **16 bpp, different formats**
  - **24 bpp, RGB**
  - **32 bpp, ARGB**

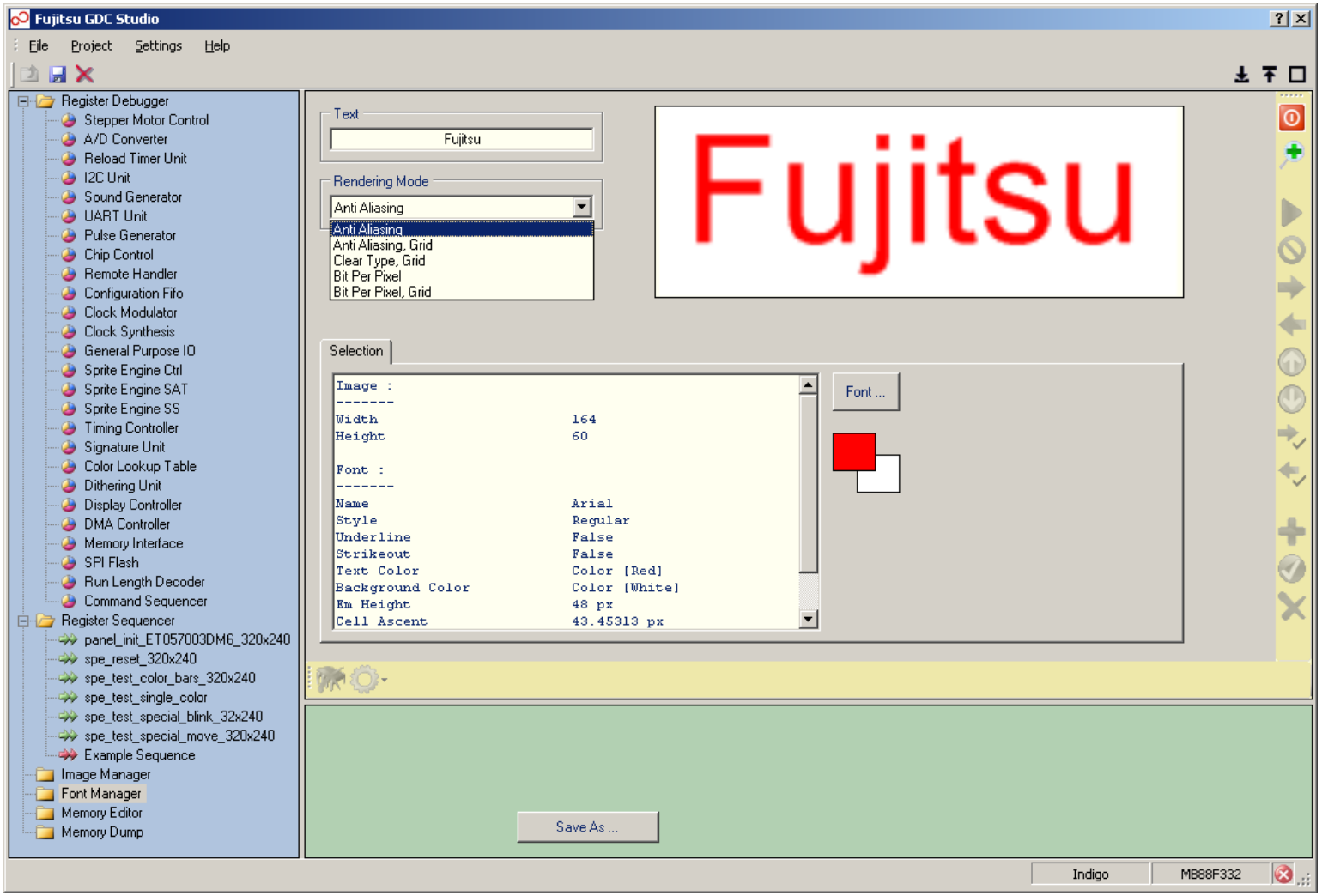
Image Manager (4)

Graphics Competence Center

- **Support for the following output pixel organization:**
  - 8 Bit
  - 16 Bit
  - 32 Bit
  - Indigo 32 Bit (Indigo Only)
  - Indigo 32 Bit RLD (Indigo Only)
  - Ruby 32 Bit ARGB (Ruby Only)
  - Ruby 32 Bit ABGR (Ruby Only)
  - Ruby 32 Bit RGBA (Ruby Only)
- **Any changes are updated immediately in the Picture Box and the corresponding tab pages**

Font Manager - Layout

Graphics Competence Center



Font Manager (1)

Graphics Competence Center

- **Support for sprite generation during application development**
  - **The Font Manager is used to simply generate attractive letters, numbers or more complex texts**
  - **The following steps are suggested:**
    1. **Select a system font (and a specific character size)**
       (if a special font is needed, copy it to the system font directory first!)
    2. **Select the required text color**
    3. **Choose the destination image background color**
    4. **Select the required rendering mode**
    5. **Save the resulting output image into a 32 bit (ARGB) file**
    6. **Load the stored file into the Image Converter for further processing**
- **All changes made are updated immediately in the Picture Box**

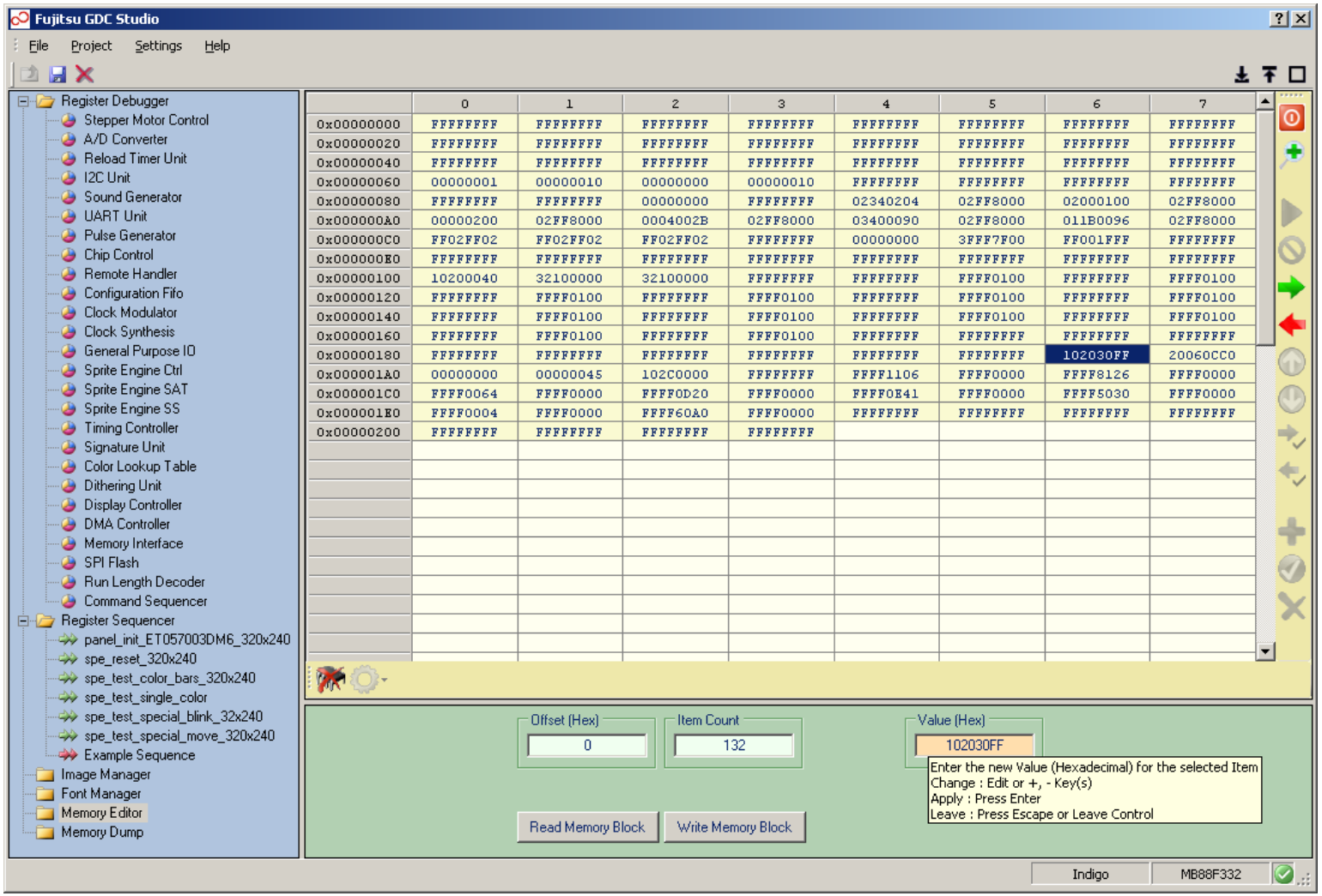
Font Manager (2)

Graphics Competence Center

- **The following rendering modes are supported:**
  - Anti-aliasing
  - Anti-aliasing (Grid)
  - Clear Type (Grid)
  - Bit Per Pixel
  - Bit Per Pixel (Grid)
- **The output image can be saved in one of the following file formats:**
  - Bmp — Bitmap
  - Png — Portable Network Graphics
  - Tiff — Tagged Image File Format
  - Jpeg — Joint Photographic Expert Group
  - Gif — Graphics Interchange Format

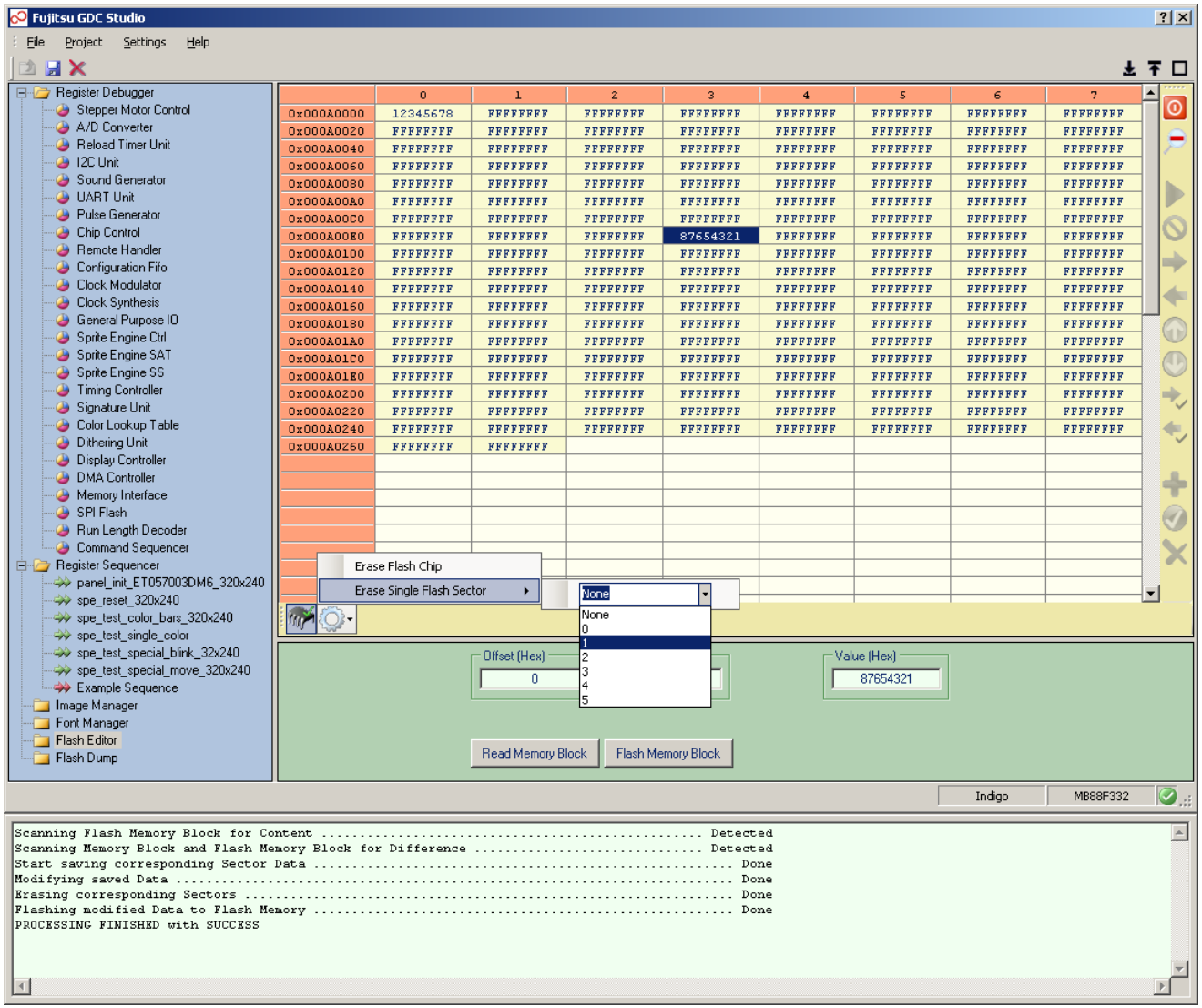
Memory Editor - Layout

Graphics Competence Center



Flash Editor - Layout

Graphics Competence Center



Memory / Flash Editor

Graphics Competence Center

Useful for several tasks

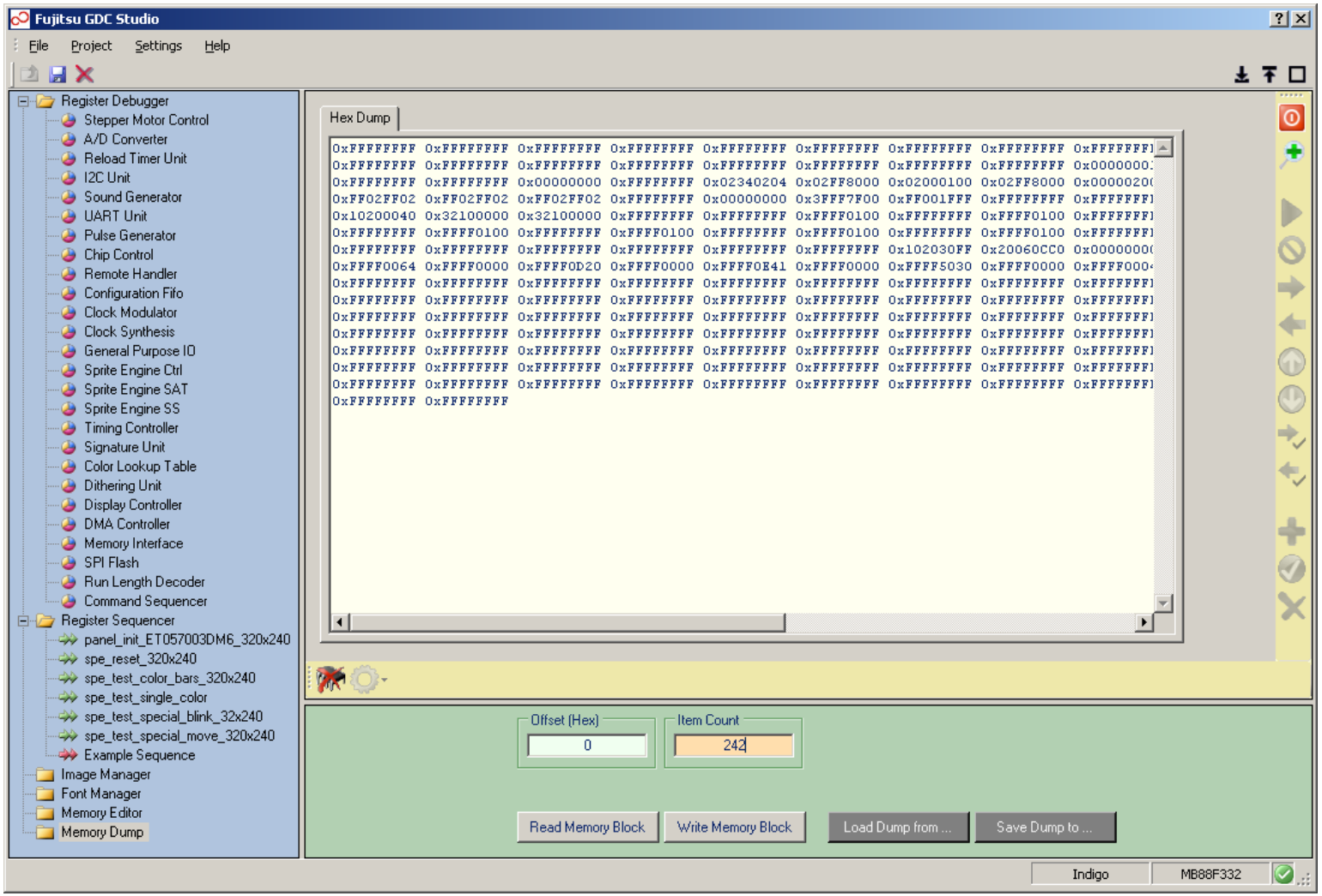
- Supports debugging and validation for both hardware and software, e.g. by dumping the memory content to check the proper loading of sprites
- Manipulation of data stored in either RAM or flash memory by:
  - reading/writing single memory cells (4 bytes each) or
  - reading/writing complete memory blocks from/to a specified address
  - Limited to 512 items per block

Using the editor is straightforward:

- Enter the start address (of register, RAM or flash memory)
- Insert the required number of items to be read (an item is the smallest unit to be dumped = 4 bytes width)
- Read out the memory block into virtual memory by pressing the corresponding button
- Manipulate single items
- Write the manipulated virtual memory block (or parts of it) back to the start address or any other specified address

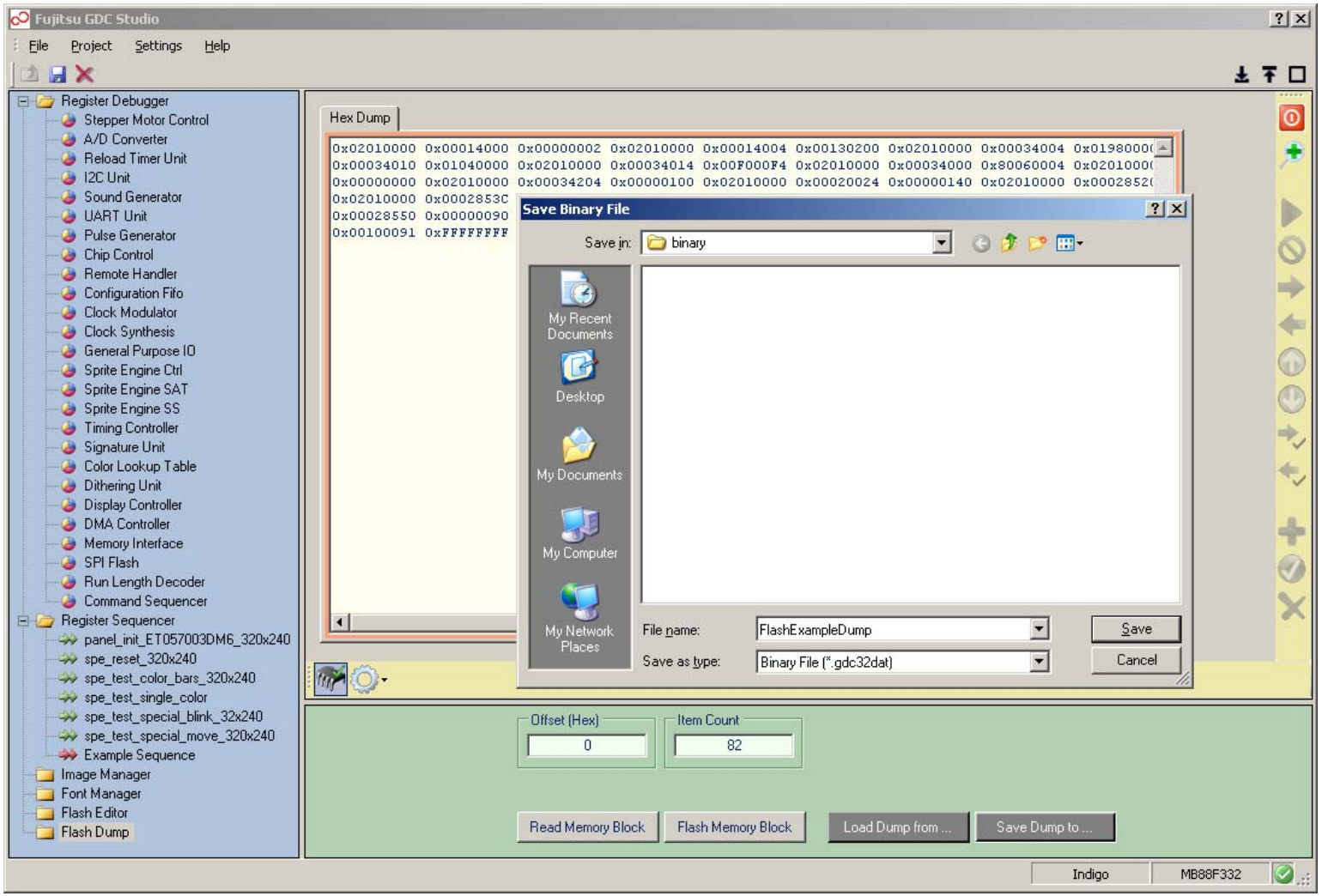
Memory Dump - Layout

Graphics Competence Center



Flash Dump - Layout

Graphics Competence Center



Memory / Flash Dump

Graphics Competence Center

- **Supported Features :**
  - **Provides an overview of large memory blocks, i.e. many more items can be dumped and listed on the screen than in the Memory Editor (currently limited to 8MByte)**
  - **Reads register, memory or flash areas**
  - **Saves the dumped data into binary files (.gdc32dat)**
  - **Reloads binary files into the dump view – also converted images**
  - **Loads Register Sequencer files (interpreted as command list values on Indigo)**
  - **Writes the dump view content to a specified address in the register, memory or flash area**
  - **An internal state machine is implemented to optimize data writing into flash memory (e.g. check if empty, check for new content before writing, automatic merges of new data and already existing identical data based on a read and comparison of corresponding sectors, ...)**

Tool Environment (1)

Graphics Competence Center

- **GDC Studio runs on Microsoft operating systems**
  - Windows 2000
  - Windows XP
  - Windows Vista (when supported from the interface driver)
  - GDC Studio's Setup Wizard provides an automatic installation process

- **Interface between a PC/Laptop and the MB88F332 (Indigo):**

  SPI
  - USB to SPI converter box 'Aardvark I2S/SPI Host Adapter'
  - GDC Studio uses the USB driver provided with the 'Aardvark' hardware
  - Must be purchased directly from the company 'TOTAL PHASE'
  - http://www.totalphase.com/products/aardvark_i2cspi/
  - Hardware is not delivered with the tool and is not included in the license fee

Tool Environment (2)

Graphics Competence Center

- **Interface between a PC/Laptop and the MB86298 (Ruby):**

SPI

- **USB to SPI converter box 'Aardvark I2S/SPI Host Adapter'**
- **GDC Studio uses the USB driver provided with the 'Aardvark' hardware**
- **Must be purchased directly from the company 'TOTAL PHASE'**
- **http://www.totalphase.com/products/aardvark_i2cspi/**
- **Hardware is not delivered with the tool and is not included in the license fee**

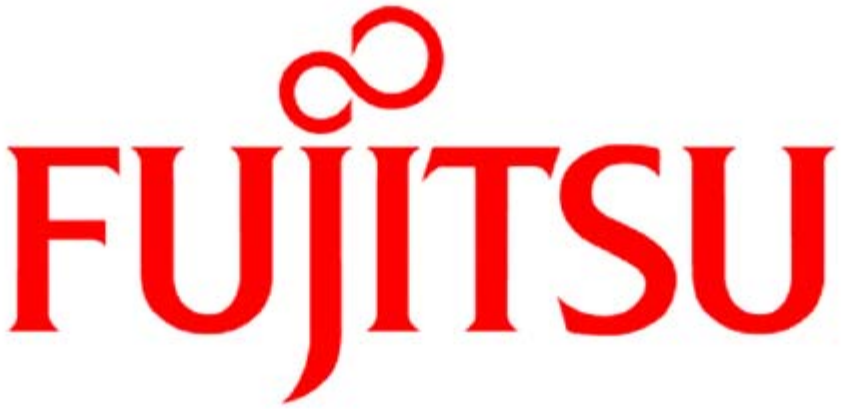
PCIe

- **For this chip design the Fujitsu GD Studio supports the PCIe connection of the Ruby Evaluation Board directly**

Licensing Model

Graphics Competence Center

- An installation must be licensed for every PC workplace (machine)
- Licenses for multiple workplaces (groups) are also possible
- A free tool is provided which supports the authorization procedure that extracts the required information from the PC workplace hardware:
  - → 'Fujitsu GDC Studio Authorization Support Tool'
- This information can be selected and sent to Fujitsu GCC to get an authorization for the use of Fujitsu GDC Studio
- The license fee depends on # installations/PC workplaces:
  - Licenses are available for groups of:
    - up to 4 workplaces
    - up to 6 workplaces
    - up to 8 workplaces
    - up to 10 workplaces
    - up to 12 workplaces
    - up to 14 workplaces
    - up to 16 workplaces



THE POSSIBILITIES ARE INFINITE